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ABSTRACT

Early computers dealt with mathematical and scientific problems requiring very little input and not much output, therefore high speed printing devices were not required. Today with increased variety of use, high speed printing is necessary and Computer Output Microfilm (COM) devices have been created to meet this need. This indirect process can increase printing speed by 40 times, with uses including dissemination and documentation in service industries; micropublishing for economical reasons; creation of library book catalogs, where catalog information is converted into a machine readable data base produced by a commercial vendor with such advantages as shared costs; ease of conversion from ASCII (American Standard Code for Information Interchange) to EBCDIC (Extended Binary Coded Decimal Interchange Code) and interpretation of material; allowance in procedures and programs required to accommodate updating of records; and the capability of varied catalog formats. The advantages of COM, e.g., no filing errors, easy duplication and dissemination, and less required space, outweigh the disadvantages, e.g., the inability to withdraw a book record, time required to add new cataloging, the required use of two look up points, and the lack of cross references. (Author/MBR)

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COMPUTER OUTPUT MICROFILM

AND LIBRARY CATALOGS

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

Presented by Richard W. Meyer, Indiana State University

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Abstract

The first computers which were heavily used were primarily involved in mathematical compulations which do not require high speed output devices. Later data processing functions which created great volumes of output promoted the development of high speed output devices which include COM recorders. These recorders make viable the economic return to book catalogs which can be widely disseminated. The combined technology of computers and COM recorders make possible a multitude of catalog formats and record structures. However, there are a number of factors which need to be considered when working with computer records used to produce COM catalogs. In addition, there are many advantages to utilizing the services of a commercial vendor to produce library catalogs. The generation of catalogs on COM also involves librarians in the disciplining process of working with machine readable records while learning what's needed to manage the data bases which some day will provide on-line access.

COMPUTER OUTPUT MICROFILM AND
LIBRARY CATALOGS

When I was originally asked to be on this program it was requested that I speak on the subject of Computer Output Microfilm (COM). So I determined to provide you with a general introduction to the concept of COM, what its history has been and how it can be used. However, I see by the program for today that my topic is Catalogs on Microfiche. Since there are quite a few microform catalogs around which are not computer generated, I suppose, then, that you may not be expecting me to talk about COM. But I'm going to do it anyway--or rather, what I'm actually going to do is target my address somewhere in between these topics.

I will talk about the general concept of COM, its history, and use. I will also talk a little about alternative formats for the card catalog. What I hope to achieve is to leave you with a sense of what is happening today and with an idea of what you need to know to be conversant in the area of COM catalogs. The brief bibliography which has been provided to you contains citations to several items which can also be very helpful.

History, technology, and standard formats.

When computers began to be used extensively as early as the 1950's, they were primarily valuable for their number crunching capability. As Spaulding has pointed out, they dealt with mathematical and scientific problems which required very little input and not much output.[1] As a result they did not require very high speed printing devices. Even today

most computer printers operate in the realm of 500 to 1,500 lines per minute. (I have learned recently that some printers are being delivered which print 20,000 lines per minute.) But these seemingly high speeds are very slow compared to the speed which computers electronically move characters around; something on the order of 500,000 characters per second. The limitation on speed is usually caused by the physical capabilities of mechanical devices. So to get the higher speed required by data processing applications which generate large volumes of paper, a non-mechanical or nearly non-mechanical technology is needed. COM devices were created to meet this need.

Stromberg Datagraphix introduced to the marketplace the first COM printout device in 1956. The technology of their equipment is based upon their invention, at that time, of the charactron (R) cathode ray tube which is shown in Figure 1. As Fran Spigai explains, "This tube permits extrusion of an electron beam through a matrix of alphanumeric and special symbolic characters which are precision etched on a metal disc. When the shaped electron beam strikes the phosphor-coated face of the CRT, a high-resolution character lights up."[2] By adding a camera one can record these characters directly from the CRT screen onto photographic film. Photographing the appropriate sequence of rapidly changing characters produces a film record of all that has appeared on the screen. By using this technology or alternative techniques invented by 3M Company and Memorex it is possible to upgrade the output speed by a computer from the slow, rattling pace of the printer at 1,500 lines per minute to an astounding 50,000 lines per minute on COM. Therefore, the computer's output speed is increased 30

to 40 times by COM. However, the process is not direct.

When working with high speed mechanical printers the computer is usually linked directly to the printer. Nearly all computer operations have some kind of printer associated with the peripheral hardware. COM, however, is usually generated at a remote location, with separate equipment. The procedure commonly used is for the computer to generate at the end of whatever data processing application is involved, a print image tape. This is merely a computer magnetic tape containing the records which are to be output on COM rather than paper. This tape is then taken to a separate location where a COM device is available. An off-line tape drive combination with a microfilmer reads the tape, reformats and indexes the data, and puts the information out on film. This roll of film from the recorder is called the master copy.

The master copy is either 16mm, 35mm, or 105mm negative film. The 16mm and 35mm forms are used as roll film and the 105mm form is chopped up into 4 x 6 inch microfiche. The COM recorder typically contains a minicomputer which can be programmed to format and index the microfilm in an appropriate manner. As pages of a document are generated, index data is extracted, stored and generated separately.[3] For roll film the index information is added to the end of the roll. For microfiche a single frame position is retained for the index. These formats of 16mm, 35mm and 105mm represent the national standards.

Within the microfiche format there are a number of standard reduction ratios. These reduction ratios apply to roll film as well but, I'll speak

about fiche because of the number of variations resulting from the several reduction ratios. The reduction ratio is the ratio of the linear measurement of a document to the linear measurement of the image of that document.[3] At 42x a character of type which is normally .1 inch high is recorded at .002 inch high. What this means is that over 300 characters occupy at 42x the same space as a single character full size. For COM fiche you usually can have 20x, 24x, 42x, 48x, or 150x. The most commonly used ratios are 24x or 42x. Datagraphix has introduced recently a 72x recorder. These ratios are very important, and quite a difference occurs between say 24 and 42x. On a 4 x 6 inch fiche at 24x reduction of computer printer size pages, you can image 63 frames. At 42x that figure jumps to 208 frames. At 72x you can image over 900 frames. Within a few years I think this 72x ratio will catch on and be very heavily used, especially for indexes and catalogs, because less than 1/4th as many fiche are required for 72x versus 42x.

Uses of COM

Because of all this flexibility in reduction ratios, formats, and speed, COM has a number of uses. The applications are almost limitless. Microfiche, have been utilized to disseminate reports and documentation, in retailing, wholesaling, banking, and numerous service industries. For instance, Sears uses COM for its service catalogs. Micro publishing on COM is another application which has only begun to get started. We have all seen the Library of Congress List of Subject Headings on COM. The Library of Congress will soon also bring the National Union Catalog out in a COM version.

Nearly any computer generated report or document which runs to more than several pages and requires distribution of more than a single copy can be economically produced on COM. One university business data processing facility determined that for any report 40 pages or more in length in a single copy it was cheaper to go to COM than to paper. When more than a single copy was required the break even point dropped sharply from 40 pages. It is this characteristic of COM which has made the library COM catalog viable. I refer you to Mr. Malincoinco's[4] paper cited in the bibliography for an excellent study on costs and the advantages of COM over paper. I'll speak further only about the technical aspects of the COM approach to library catalogs.

COM catalogs

In order to generate a COM catalog it is necessary for a library to have its catalog information converted into a machine readable data base. A source for the records in the data base is required. Many libraries are currently, conveniently building their data base from OCLC archive tapes. There are other sources as well. MARC level records also can be obtained from Library of Congress MARC tapes, or from BALLOTS or from a number of commercial vendors. They can even be keyed in-house. Whichever approach is used will be determined by the individual library's needs and by the end result that is sought. One frequently used approach is to obtain records by using OCLC and then to turn these over to a commercial service for data base maintenance and COM production.

There are only a few libraries which maintain their own in-house COM

catalog production facilities based on MARC records. Hennepin County Library in Minnesota and New York Public are two of the best known. Most COM catalogs are generated by commercial vendors such as Bro-Dart, Autographics, Blackwell/NA, and Science Press. There are others as well. The reason for this is that creation and maintenance of the necessary computing equipment and programs is a very expensive process. By using a commercial service this cost is shared by many. However, there are a number of other advantages to using a commercial vendor besides the shared cost issue.

These other advantages center around the complications involved in maintaining a machine readable data base and in generating the actual catalog. Let me illustrate by pointing out some of the work that is required to utilize an OCLC archive tape for COM catalog production.

First, these tapes are coded in ASCII (American Standard Code for Information Interchange). This is fine because it is a standard. Unfortunately, IBM equipment--the most commonly used brand--isn't used to working with ASCII code. It prefers EBCDIC (Extended Binary Coded Decimal Interchange Code). Well, you can tell the computer that you are going to feed it an ASCII tape and it will know to translate this to EBCDIC before doing anything else with the data. Unfortunately there are a few characters used in MARC records which are defined a particular way in ASCII by the Library of Congress but which are translated by the IBM utility into inappropriate symbols. This is because IBM used the associated decimal code to define some other character or control symbol than the one which we expected. What this means is that you have to allow for a program at the front end of your catalog programs to

properly translate a few little symbols such as the end of field delimiter.

Second, these tapes may include multiple uses of an individual OCLC record. Every time you OCLC users update on a record from which you have produced or updated before, an additional copy of that record will appear on your archive tape. Your program has to be able to tell which one of these to use. In most cases the latest use will be the one you want, but it is possible that an earlier use is the valid record. Some allowance in procedures and programs is required to accomodate this.

Third, individual records will contain information that needs to be interpreted before it can be used. For instance, the size of books is recorded in the collation field in MARC records. OCLC card production programs match the size indicated in a record with the individual library's profile to determine if an oversize stamp is required on the catalog card. A similar accomodation is required in COM catalog production programs, otherwise users could be looking for oversize books in the wrong place. Similarly anything that is interpreted in card production programs also has to be interpreted in COM production. Most of these conditions can be handled by the vendor providing your catalog, however, you do have to know enough to provide him with the rules. In other words, 36 or more centimeters means oversize book. There are some things vendors won't do for you, however.

No vendor can completely maintain bibliographic integrity for you. If you misspell an author's name or use an inappropriate subject heading the vendor won't catch your error. The vendor won't necessary keep track of your

collection for you. If you add a copy or lose a book, that information will have to be provided to the vendor along with new records in order to maintain your data base.

The vendors will do a pretty good job of working with you to generate your catalog. The process involved is straightforward and is illustrated in Figure 2. This particular description shows part of the process being handled on a local computer but this should be a vendor service.

Fourth, the main advantages of using a vendor results from the necessity for the vendor to create flexible software because of a diversity of customers. By flexible I mean capable of generating catalogs in a number of varieties and formats. Many libraries will require a more or less traditional catalog. This could be a divided author, title, subject catalog which looks essentially just like a card catalog. Even so, because of the automation involved, a COM catalog can be generated with less hassle and expense than a card catalog and be worthwhile on that basis. However, it is possible, indeed desirable, to take advantage of our technology to produce some variations. For example, it is possible to create a name catalog, or a publishers catalog, or a key-word catalog, or a chronological catalog, or a form of media catalog. These can all be accomplished and have been demonstrated. For instance, Blackwell/NA created for one Texas library a subject catalog which was subfiled not by author but by reverse chronological sequence instead. What's more, if you change your mind it's possible to change the output product very readily. Going back to the author sequence from chronological sequence requires only a minor program change. Compare that to a similar change in a card catalog. What I've just

shown here is one of the advantages of the COM over the card catalog, as much as it is an advantage of using vendor services.

There are other advantages to COM over cards. There are no filing errors. The rules are less sophisticated as Figure 3 illustrates, but within the rules the computer won't make mistakes.

The catalog is easily duplicated and widely disseminated. You could put copies of the catalog in every building on campus or every branch. Individual copies of microfiche cost 10 to 20 cents apiece depending on the service bureau used.

The catalog on COM is quicker to use. Within a few minutes a beginning patron can learn to search microfiche faster than cards.

A COM catalog doesn't require much space. For a card catalog you usually need one nice large area. COM catalogs can be stuck in nooks and crannies all over the library.

On the other hand, there are some disadvantages to COM. When you find the book you want in the catalog you cannot yank the card from the drawer and carry it to the shelves. The film also does not make very good scratch paper like withdrawn card sets. A number of other shortcomings have been pointed out by others.[6] But these are often just straw horses or non-issues. For instance, the COM catalog isn't supposed to be timely. It takes a few weeks from the time that the produce button is punched on the OCLC terminal until the item appears in the COM catalog. However, these delays are not in practice

much different from card filing delays. Another criticism occurs because COM catalogs usually require a separate supplement which necessitates two point look-up for all items. But this idea is missleading because the supplement need be checked only in those cases where the search is not successful or completed in the main part of the catalog. This problem decreases as the supplement begins to represent a smaller and smaller percentage of the collection. A third frequent criticism of COM catalogs is that they lack cross references. This is true of many but it does not have to be true as can be seen in Figure 4. The software of many vendors include a facility for authority control; particularly subject control which is probably the area where cross references are most needed. None of the criticisms of COM which I have run into are serious, all are outweighed by significant advantages, and most can be dealt with in terms of technological refinements.

What COM means

I've spent the past several minutes talking about the technological aspects of COM and what it is. I'd like to conclude by saying something about what it means.

During the two decades immediately preceeding the turn of the century a significant transition took place in the way libraries recorded their holdings. For a few thousand years libraries had commonly provided access to their collections by simply making a list of their holdings. There were

refinements of that technique, but because of the industrial revolution and coinciding events, such as an explosion of literature, a new system was required to help users locate the material they needed. A brilliant innovation resulted.

The work of Cutter, Panizzi, Jewett and others resulted in a standardized way of organizing collections which utilized the 3 x 5 card and a set of logical principles for organizing materials. A marvelous tool called the card catalog resulted because of the effectiveness of the dictionary catalog and LC's printed card service. It was flexible, rigorous, timely and effective. You could make additions and changes on a daily basis which provided an instantaneous update on the condition of the collection. It was consistent because logical rules made it so. It was effective because it did the job.

Today, however, we are in the midst of another revolution. We have a new explosion of literature. We have a rapidly changing technology. We have a change from the industrial society to what some have called the communications age. To what we will eventually level off, is as yet unclear. Future shock and changing social values have had affects in every area. The card catalog is also a victim. It is no longer an effective tool. In response to its ineffectiveness librarians have sought out and begun to use the technology of the computer. With the computer the ease and flexibility of providing access to material is greatly enhanced. With the computer it is possible to provide very handy, reproduceable printed lists and indexes, but these are

slow and expensive. With the computer it is possible to provide on-line, real-time access, but this is also too expensive for most libraries. However, COM falls right in between. It is the choice of many libraries because of convenience. It is fast and timely and it is also economical. The University of Toronto and others have proven this so. And in regard to the University of Toronto one final point about COM can be made. It was the original intention there to provide an on-line catalog. The staff at Toronto still intend someday to provide access on-line. This is where the future lies. But in the meantime, as Toronto and all the rest of us learn how to manage computers and data bases, COM remains the convenient choice of alternatives.

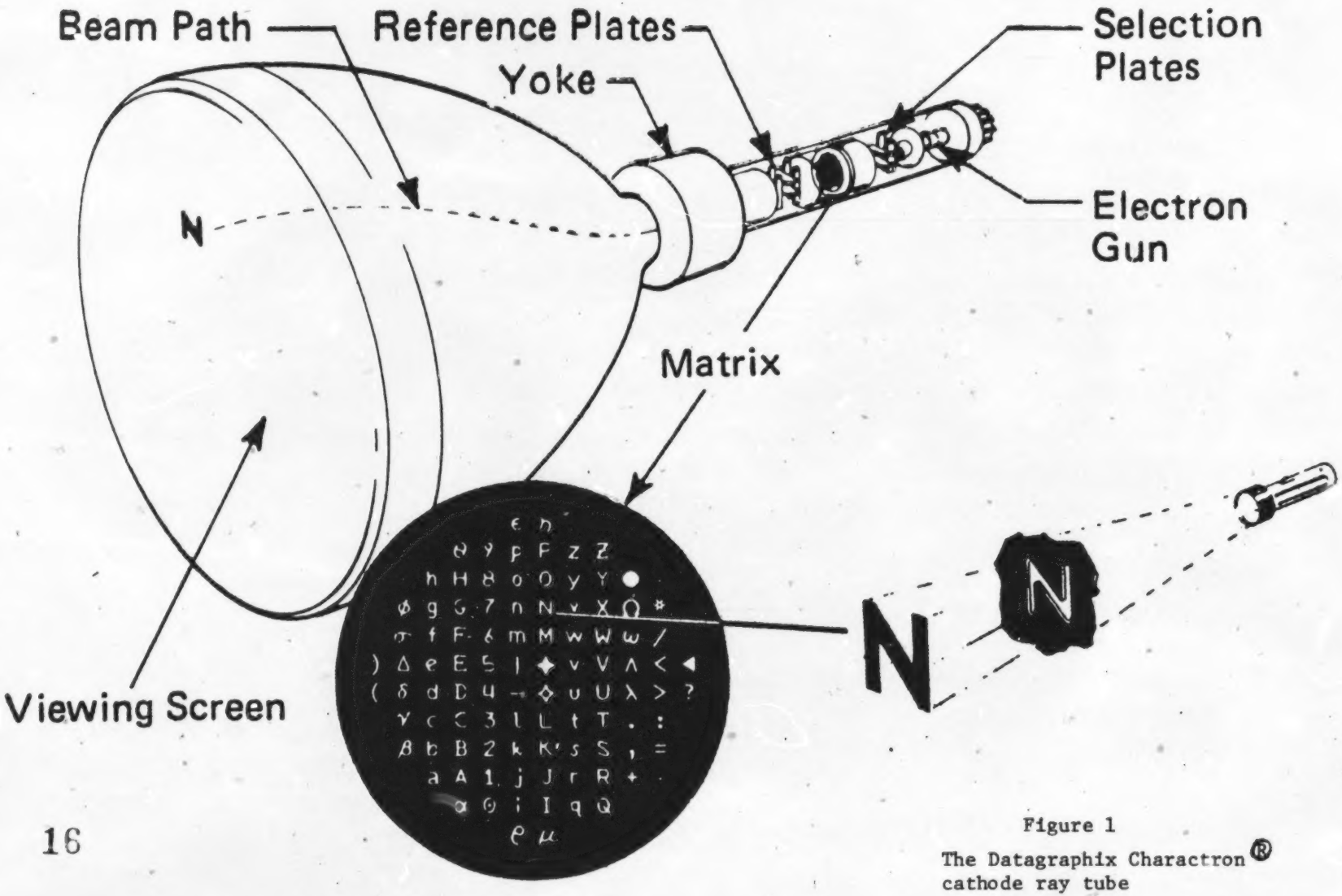
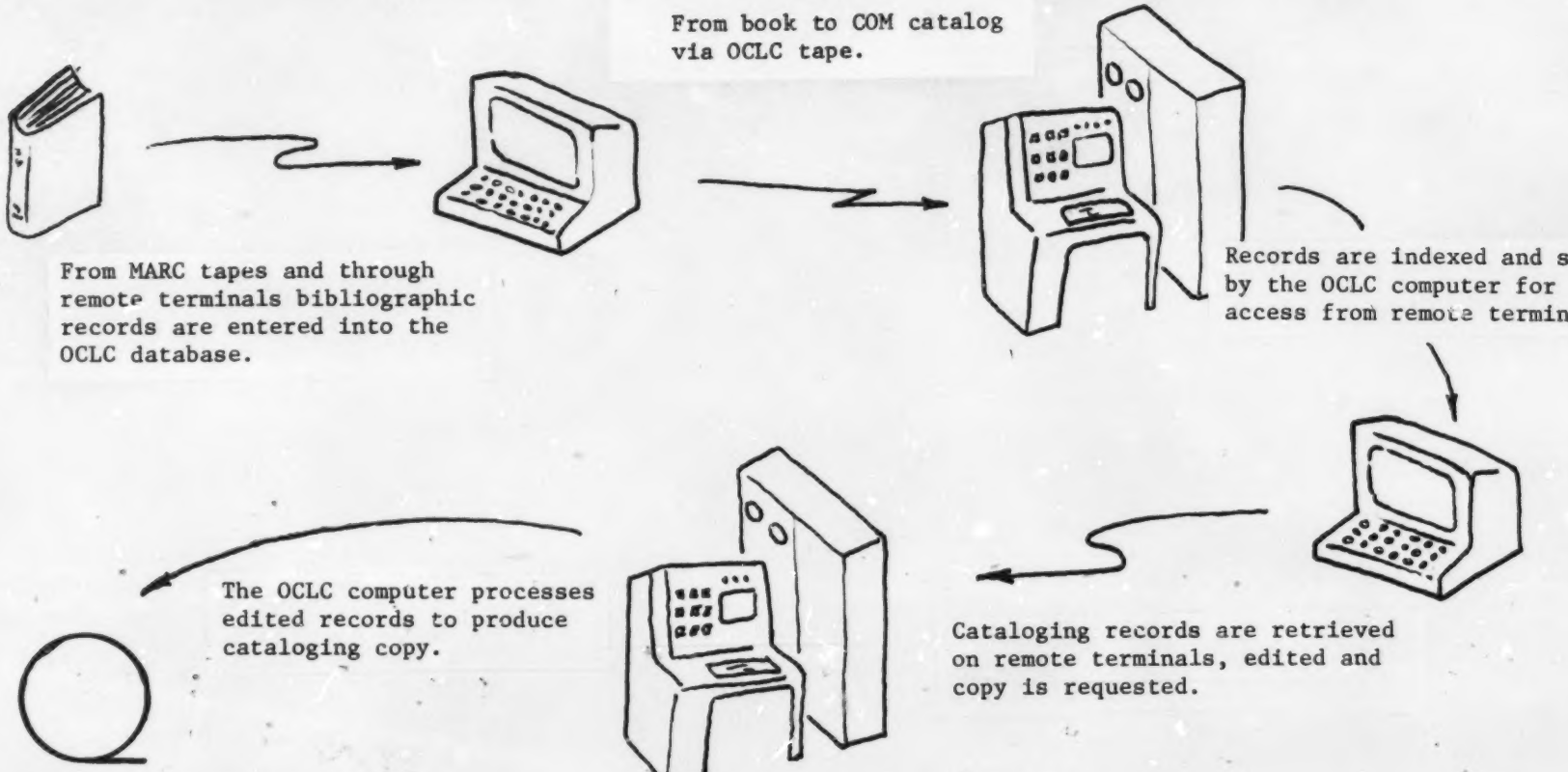


Figure 1

The Datagraphix Charactron® cathode ray tube

Figure 2

From book to COM catalog via OCLC tape.



From MARC tapes and through remote terminals bibliographic records are entered into the OCLC database.

Records are indexed and stored by the OCLC computer for access from remote terminals.

Cataloging records are retrieved on remote terminals, edited and copy is requested.

The OCLC computer processes edited records to produce cataloging copy.

Library recieves cataloging in the form of MARC level records on magnetic tape.

Records are merged with previous data by local computer. Print tape of separate author, title, subject catalogs and shelf list is produced.

Computer Output Microfiche equipment converts print tape to microfiche catalog.

Card Catalog	COM
A moi de jouer	19th Century poets
AOPA Pilot	50 years a slave
Abbott, Daniel J.	A moi de jouer
Abbott, Martha S.	Abbott, Daniel J.
Abbott Laboratories	Abbott-Fanning, Cecil
Abbott-Fanning, Cecil	Abbott Laboratories
50 years a slave	Abbott, Martha S.
London, Jack, 1876-1916	AOPH Pilot
London belongs to me	London belongs to me
London. Biological Society	London. Biological Society
Londonderry, Frances	London, Jack, 1876-1916
19th Century poets	Londonderry, Frances
Police	Police
Police--Recruiting	Police administration
Police, Private	Police, Private
Police, Rural	Police--Recruiting
Police administration	Police regulations
Police regulations	Police, Rural
Policewomen	Policewomen

Figure 3. Comparison of filing arrangement of cards under ALA rules with a computer sort for COM.

FOOTNOTES

1. Spaulding, Carl M. "A primer on COM..." American Libraries 7/7: 468-69 (July-August'76) p. 468

2. Spigai, Francis. "Computer output microfilm" Advanced Tech/Libs. 1/5: 1 (May 72)

3. Spigai, Ibid, p.2.

4. Malinconico, S. Michael. "The display medium and the price of the message" Library Journal 101/18: 2145-2149 (October 15 '76)

5. DeBruin, Valentian "Sometimes dirty things are seen on the screen" Journal of Academic Librarianship 3/5: 260 (Nov. '77)

6. Altman, Ellen "On my mind: reactions to a COM catalog" Journal of Academic Librarianship 3/5: 267-268 (Nov. '77)

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